High-precision measurements of charge asymmetries at LHCb

Dufour, Laurent Johannes Iman Joseph

DOI:
10.33612/diss.95089498

Propositions belonging to the PhD thesis

High-precision measurements of charge asymmetries at LHCb

Laurent Dufour

1. Performing a measurement always relies on assumptions in the parametrisation of the detector's efficiencies. Future measurements of CP asymmetries should, therefore, thoroughly check these assumptions and cannot simply repeat earlier procedures. Decays of J/ψ and D^0 mesons are well suited for these checks.
2. Once accounting for the increased detector occupancy, the LHCb Outer Tracker does not show a significant increase or loss in gain in Run 2 when comparing to 2010.
3. The study of neutral meson mixing provides limits on parameters of particle physics models which are relevant for decades, as has been shown for the neutral kaon system.
4. The varying distribution of material in the LHCb spectrometer gives rise to a notable charge asymmetry in the reconstruction efficiency of hadrons.
5. The charge asymmetry in hadronic interactions with the LHCb detector material can be approximated by using the known hadronic cross-sections on deuterium targets. A forthcoming analysis of the charge asymmetry of the proton will provide a strong test of this hypothesis.
6. Charge asymmetries in the reconstruction efficiency of charged particles at LHCb can be calibrated with the help of VELO tracks, i.e. the reconstructed trajectory in the vertex detector only. The resulting precision is sufficient to optimally interpret the data set recorded in Run 2 of the LHC. Adding a (strong) magnetic field in the LHCb vertex detector will jeopardise the simplicity of these useful calibrations.
7. The speed of track-reconstruction algorithms and the amount of data recorded are not relevant if the resulting precision in important observables does not improve and should, therefore, not be pursued blindly.
8. The construction of a new particle accelerator should be motivated by our curiosity. Meanwhile, discussions related to future colliders see too little participation by the generation that will have to analyse the resulting data.
9. Scientific conclusions can be in conflict with a lifestyle which is, at that moment, regarded as a standard. That does not make them any less true.